Bibliography

[1] Milton Abramowitz and Irene A. Stegun. *Handbook of Mathematical Functions with Formulas, Graphs, and Mathematical Tables*. Dover, 1970.

[2] Alexander Aitken. On Bernoulli's numerical solution of algebraic equations. *Proceedings of the Royal Society of Edinburgh*, 46:289–305, 1926.

[3] Robert S. Anderssen and Gene H. Golub. Richardson's non-stationary matrix iterative procedure. Technical Report CS-TR-72-304, Computer Science Department, Stanford University, 1972.

[4] Bengt Aspvall and John R. Gilbert. Graph coloring using eigenvalue decomposition. *SIAM J. Alg. Disc. Meth.*, 5(4), 1984.

[5] Forbes A. B. Geometric tolerance assessment. *TR DITC 210/92, National Physical Laboratory,Teddington*, 1992.

[6] Pierre Baldi and Edward Posner. Graph coloring bounds for cellular radio. *Computers Math. Applic.*, 19(10):91–97, 1990.

[7] Richard Barrett, Michael Berry, Tony F. Chan, James Demmel, June Donato, Jack Dongarra, Victor Eijkhout, Roldan Pozo, Charles Romine, and Henk van der Vorst. *Templates for the Solution of Linear Systmes: Buliding Blocks for Iterative Methods*. SIAM, 1994.

[8] M. Benzi. Splittings of symmetric matrices and a question of Ortega. *Linear Algebra and its Applications*, 429:2340–2343, 2008.

[9] Å. Björck. *Numerical Methods for Least Squares Problems*. SIAM, 1996.

[10] Susanne C Brenner and Larkin Ridgway Scott. *The mathematical theory of finite element methods*, volume 15. Springer, 2008.

[11] C. Brezinski. *Accélération de la Convergence en Analyse Numérique*. Number 584 in Lecture notes in Mathematics 584. Springer, 1977.

[12] M. Bronstein. *Symbolic Integration I : Transcendental Functions*, volume 1 of *Algorithms and Computation in Mathematics*. Springer, 1996.

[13] J. C. Butcher. On runge-kutta processes of high order, part 2. *J. Austral. Math. Soc.*, IV:179–194, 1964.

[14] John C Butcher. *Numerical methods for ordinary differential equations*. John Wiley & Sons, 2008.

W. Gander et al., *Scientific Computing - An Introduction using Maple and MATLAB*,
Texts in Computational Science and Engineering 11,
DOI 10.1007/978-3-319-04325-8,

[15] B. P. Butler, A. B. Forbes, and P. M. Harris. Algorithms for geometric tolerance assessment. *TR DITC 228/94, National Physical Laboratory, Teddington*, 1994.

[16] G. Cardano. *Ars Magna or The Rules of Algebra, 1545*. MIT, 1968.

[17] I. B. Cohen. *Howard Aiken : Portrait of a Computer Planner*. MIT Press, 1999.

[18] James W. Cooley and John W. Tukey. An algorithm for the machine calculation of complex fourier series. *Math. Comput.*, 19:297–301, 1965.

[19] I.D. Coope and C.J. Price. A modified BFGS formula maintaining positive definiteness with Armijo-Goldstein steplengths. *Journal of Compuational Mathematics*, 13:156–160, 2008.

[20] C.F. Curtiss and J.O. Hirschfelder. Integration of stiff equations. *Proc. Nat. Acad. Sci. U.S.A.*, 38:235–243, 1952.

[21] Germund Dahlquist. Convergence and stability in the numerical integration of ordinary differential equations. *Math. Scand.*, 4:33–53, 1956.

[22] Germund Dahlquist. A special stability problem for linear multistep methods. *BIT*, 3:27–43, 1963.

[23] G.B. Dantzig. Maximization of a linear function of variables subject to linear inequalities. In T.C. Koopmans, editor, *Activity Analysis of Production and Allocation*, pages 339–347. Wiley, New York, 1951.

[24] C. de Boor. *A Practical Guide to Splines*. Springer, 1978.

[25] Carl de Boor. *Splinefunktionen*. Birkhäuser, 1990.

[26] J. Dongarra, C. Moler, J. Bunch, and G. W. Stewart. *LINPACK Users' Guide*. SIAM, 1979.

[27] J. Dongarra and F. Sullivan. The top 10 algorithms. *Computing in Science and Engineering*, 2(1):22–23, 2000.

[28] Michael Drexler and Martin J Gander. Circular billiard. *SIAM review*, 40(2):315–323, 1998.

[29] L. Euler. *Institutionum Calculi Integralis. Volumen Primum*, volume XI of *Opera OMNIA*. Birkhäuser, 1768.

[30] Haw-ren Fang and Dianne P. O'Leary. Modified Cholesky algorithms: a catalog with new approaches. *Math. Program., Ser. A*, 115:319–349, 2008.

[31] K. Fernando and B. Parlett. Accurate singular values and differential qd algorithms. *Numerische Mathematik*, 67:191–229, 1994.

[32] R. Fletcher. Conjugate gradient methods for indefinite systems. In G. Alistair Watson, editor, *Numerical Analysis– Dundee 1975*, volume 506, pages 73–89. Lecture Notes in Mathematics, Springer-Verlag, Heidelberg, 1976.

[33] G. Forsysthe and P. Henrici. The cyclic jacobi method for computing the principal values of acomplex matrix. *Trans. Amer. Math. Soc.*, 94:1–23, 1960.

[34] J. G. F. Francis. The qr transformation, a unitary analoque to the lr transformation – part 1. *The Computer Journal*, 4:265–271, 1961.

[35] Roland Freund and Noël Nachtigal. QMR: A quasi-minimal residual method for non-Hermitian linear systems. *Numerische Mathematik*, 60:315–339, 1991.

[36] A. Gamst and W. Rave. On the frequency assignment in mobile automatic telephone systems. In *Proc. of GLOBECOM 82*, pages 309–315, 1982.

[37] Martin J. Gander and Felix Kwok. Chladni figures and the Tacoma bridge: motivating PDE eigenvalues problems via vibrating plates. *SIAM Rev.*, 54:573–596, 2012.

[38] M.J. Gander, K. Santugini, and A. Steiner. La rete stradale piu breve che collega le citta (shortest road network connecting cities). *Bolettino dei docenti di matematica*, 56:9–19, 2008.

[39] W. Gander. On Halley's iteration method. *The American Mathematical Monthly*, 92(2), 1985.

[40] W. Gander. Algorithms for the polar decomposition. *SIAM J. on Sci. and Stat. Comp.*, 11(6), 1990.

[41] W. Gander. *Computermathematik*. Birkhäuser, 1992.

[42] W. Gander. Zeros of determinants of λ-matrices. In *Proceedings in Applied Mathematics and Mechanics*, volume 8, pages 10811–10814. Wiley, 2008.

[43] W. Gander and W. Gautschi. Adaptive quadrature - revisited. *BIT*, 40(1):84–101, 2000.

[44] W. Gander and D. Gruntz. The billiard problem. *International Journal of Mathematical Education in SCIENCE and Technology*, 23(6):825–830, 1992.

[45] W. Gander and J. Hřebíček. *Solving Problems in Scientific Computing using Maple AND Matlab*. Springer, 3rd edition, 1997.

[46] Walter Gander and Dominik Gruntz. Derivation of numerical methods using computer algebra. *SIAM Review*, 41(3), 1999.

[47] Garbow, Boyle, Dongarra, and Moler. *EISPACK Guide Extension*. Lecture Notes in Computer Science. Springer, 1977.

[48] Walter Gautschi, Ronald S FRIEDMAN, Jonathan BURNS, Rajan DARJEE, and Andrew MCINTOSH. *Orthogonal Polynomials: Computation and Approximation, Numerical Mathematics and Scientific Computation Series*. Oxford University Press, Oxford, 2004.

[49] Philip E Gill, Walter Murray, and Margaret H Wright. Practical optimization. 1981.

[50] L. Giraud, J. Langou, M. Rozlǒzník, and J. van den Eshof. Rounding error analysis of the classical gram-schmidt orthogonalization process. *Numerische Mathematik*, 101:87–100, 2005.

[51] G. H. Golub and C. F. Van Loan. *Matrix Computations*. Johns Hopkins Studies in the Mathematical Sciences. Johns Hopkins University Press, Baltimore, MD, 1996.

[52] G. H. Golub and J. H. Welsch. Calculation of gauss quadrature rules. *Math. Comp.*, 23:221–230, 1969.

[53] Gene Golub and Christian Reinsch. Singular value decomposition and least squares solutions. *Numerische Mathematik*, 14:403–420, 1970.

[54] Gene H. Golub. *The Use of Chebyshev Matrix Polynomials in the ITERATIVE Solution of Linear Equations Compared to THE Method of Successive*

Overrelaxation. PhD thesis, University of Illionis at Urbana-Champaign, 1959.

[55] Gene H. Golub and William Kahan. Calculating the singular values and pseudo-inverse of a matrix. *SIAM J. Numer. Anal.*, 2:205—224, 1965.

[56] Gene H. Golub and Victor Pereyra. The differentiation of pseudoinverses and nonlinear least squares problems whose variables separate. *SIAM J. Numer. Anal.*, 10:416–432, 1973.

[57] N. I. M. Gould and S. Leyffer. An introduction to algorithms for nonlinear optimization. In *Frontiers in Numerical Analysis*, pages 109–197. Springer Verlag, 2003.

[58] Andreas Griewank and Andrea Walther. *Evaluating Derivatives: Principles and Techniques of ALGORITHMIC Differentiation*. SIAM, 2008.

[59] Martin Gutknecht. Lanczos-type solvers for nonsymmetric linear systems of equations. *Acta Numerica*, pages 271–397, 1997.

[60] J. Hadamard. Sur les problèmes aux dérivées partielles et leur signification physique. *Princeton University Bulletin*, 13:49–52, 1902.

[61] E. Hairer, Ch. Lubich, and G. Wanner. *Geometric Numerical Integration: Structure-Preserving Algorithms for Ordinary Differential Equations*. Springer-Verlag, 2002.

[62] E. Hairer, S. P. Nørsett, and G. Wanner. *Solving Ordinary Differential Equations I, Nonstiff PROBLEMS*. Springer-Verlag, 2nd revised edition, 1993.

[63] E. Hairer and G. Wanner. *Solving Ordinary Differential Equations II, the Stiff CASE*. Springer-Verlag, 2nd revised edition, 1994.

[64] E. Hairer and G. Wanner. *Analysis by Its History*. Springer, New York, 1996.

[65] R. Hanson and M. Norris. Analysis of measurements based on the singular value decomposition. *SIAM J. on Sci. and Stat. Comp.*, 2(3), 1981.

[66] Jin-Kao Hao and Raphaël Dorne. Study of genetic search for the frequency assignment problem. In *Artificial Evolution European Conference*, pages 333–344. Springer-Verlag, 1996.

[67] P. Henrici. On the speed of convergence of cyclic and quasicyclic jacobi methods for computing eigenvalues of hermitian matrices. *J. Soc. Indust. Appl. Math.*, 6:144–162, 1958.

[68] P. Henrici. *Discrete variable methods in ordinary differential equations*. Wiley, 1962.

[69] P. Henrici. *Elements of Numerical Analysis*. Wiley, 1964.

[70] M. Hestenes and E. Stiefel. Methods of conjugate gradients for solving linear systems. *J. Research Nat. Bur. Standards*, 49:409–436, 1952.

[71] Nicholas J. Higham. *Accuracy and stability of numerical algorithms*. SIAM, 2002.

[72] A.S. Householder. On the convergence of matrix iterations. Technical Report 1883, Oak Ridge National Laboratory, 1955.

[73] Thomas JR Hughes. *The finite element method: linear static and dynamic finite element analysis*. DoverPublications. com, 2012.

[74] C. G. J. Jacobi. über ein leichtes verfahren, die in der theorie der säkularstörungen vorkommenden gleichungen numerisch aufzulösen. *Crelle's Journal*, 30:51–94, 1846.

[75] F. John. *Advanced Numerical Methods.* Lecture Notes, Department of Mathematics, 1956.

[76] Johan Joss. *Algorithmishes Differenzieren.* PhD thesis, Eidgenoessische Technische Hochschule, Zürich, Switzerland, 1976.

[77] William Kahan. *Gauss-Seidel Methods of Solving Large Systems of Linear EQUATIONS.* PhD thesis, University of Toronto, 1958.

[78] D. K. Kahaner. Comparison of numerical quadratur formulas. *Mathematical Software*, pages 229–269, 1971.

[79] Narendra Karmarkar. A new polynomial-time algorithm for linear programming. In *Proceedings of the sixteenth annual ACM symposium on Theory of computing*, pages 302–311. ACM, 1984.

[80] Daniel Kressner. *Numerical methods for general and structured eigenvalue problems*, volume 46. Springer, 2005.

[81] Jeffrey C. Lagarias, James A. Reeds, Margaret H. Wright, and Paul E. Wright. Convergence properties of the Nelder-Mead simplex method in low dimensions. *SIAM Journal of Optimization*, 9:112–147, 1998.

[82] Cornelius Lanczos. An iterative method for the solution of the eigenvalue problem of linear differential and integral operators. *J. Res. Nat. Bur. Standards, Sect. B.*, 45:225–280, 1950.

[83] Cornelius Lanczos. Solution of systems of linear equations by minimized iterations. *J. Res. Nat. Bur. Standards, Sect. B.*, 49:33–53, 1952.

[84] Ben Leimkuhler and Sebastian Reich. *Simulating Hamiltonian Dynamics.* Cambridge University Press, 2005.

[85] Steven J. Leon. *Linear Algebra with Applications.* Pearson, 2010.

[86] Jörg Liesen and Zdenek Strakos. *Krylov subspace methods: principles and analysis.* Oxford University Press, 2012.

[87] J. Liouville. Remarques nouvelles sur l'équation de riccati. *J. des Math. pures et appl.*, 6:1–13, 1841.

[88] James N Lyness and Cleve B Moler. Numerical differentiation of analytic functions. *SIAM Journal on Numerical Analysis*, 4(2):202–210, 1967.

[89] J. Liesen M.Benzi, G.H.Golub. Numerical solution of saddle point problems. *Acta Numerica*, 14:1–137, 2005.

[90] JB McLeod. A note on the ε-algorithm. *Computing*, 7(1-2):17–24, 1971.

[91] J. C. P. Miller. *Neville's and Romberg's Processes: A fresh Appraisal with Extensions*, volume 263 of *Series A, Mathematical and Physical Sciences.* Philosophical Transactions of the Royal Society of London, 1969.

[92] C. Moler. The qr algorithm – striving for infallibility. *MathWorks Newsletter*, 1995.

[93] Cleve Moler and Charles Van Loan. Nineteen dubious ways to compute the exponential of a matrix. *SIAM Review*, 20(4), 1978.

[94] A. M. Mood and F. A. Graybill. *Introduction to the Theory of Statistics.* McGraw-Hill Book Company, New York, 2nd edition, 1963.

[95] I. Newton. *Methodus Fluxionum et Serierum INFINITARUM*, volume 1 of *Opuscula mathematica.* edita Londini, 1736. Traduit en franç ais par M. de Buffon, Paris MDCCXL.

[96] Alan V. Oppenheim and Alan S. Willsky. *Signals & Systems.* Prentice Hall, 1996.

[97] J örg Waldvogel. Fast construction of the fejér and clenshaw-curtis quadrature rules. *BIT*, 46(1):195–202, 2006.

[98] AM Ostrowski. On the linear iteration procedures for symmetric matrices. *Rend. Mat. Appl*, 14:140–163, 1954.

[99] A.M. Ostrowski. *Solution of Equations and Systems of Equations.* Academic Press, 1973.

[100] M. L. Overton. *Numerical Computing with IEEE Floating Point Arithmetic.* SIAM, 2001.

[101] Chris C. Paige and Michael A. Saunders. Solution of sparse indefinite systems of linear equations. *SIAM J. Numer. Anal.*, 12:617–629, 1975.

[102] Chris C. Paige and Michael A. Saunders. LSQR: An algorithm for sparse linear equations and sparse least squares. *ACM Trans. Math. Soft.*, 8:43–71, 1982.

[103] Christopher Conway Paige. *The computation of eigenvalues and eigenvectors of very large sparse matrices.* PhD thesis, University of London, 1971.

[104] B. N. Parlett. *The Symmetric Eigenvalue Problem.* Classics in Applied Mathematics. SIAM, 2nd edition, 1998.

[105] Edgar Reich. On the convergence of the classical iterative method of solving linear simultaneous equations. *The Annals of Mathematical Statistics*, 20(3):448–451, 1949.

[106] Lewis Fry Richardson. On the approximate arithmetical solution by finite differences of physical problems involving differential equations, with an application to the stresses in a masonry dam. *Proceedings of the Royal Society of London. Series A*, 83(563):335–336, 1910.

[107] M. Rojas, S.A. Santos, and D.C. Sorensen. A new matrix-free algorithm for the large-scale trust-region subproblem. *SIAM J. Optim.*, 11(3):611–646, 2000.

[108] Walter Rudin. *Real and Complex Analysis.* McGraw-Hill, International Edition, 1987.

[109] H. Rutishauser. Der quotienten-differenzen-algorithmus. *Z. Angew. Math. Physik*, 5(1):233–251, 1954.

[110] H. Rutishauser. *Der Quotienten-Differenzen-Algorithmus.* Birkhäuser, 1957.

[111] H. Rutishauser. *Description of ALGOL 60.* Springer, 1967.

[112] H. Rutishauser. *Lectures on Numerical Mathematics.* Birkhäuser, 1990.

[113] H. Rutishauser and H. R. Schwarz. The lr transformation method for symmetric matrices. *Numerische Mathematik*, 5:273–289, 1963.

[114] Heinz Rutishauser. Über die Instabilität von Methoden zur Integration gewöhnlicher Differentialgleichungen. *ZAMP*, 3:65–74, 1952.

[115] Heinz Rutishauser. Beiträge zur kenntnis des biorthogonalisierungs- algorithmus von lanczos. *Zeitschrift für angewandte Mathematik und Physik (ZAMP)*, 4(1):35–56, 1953.

[116] W. Gander S. J. Leon, Å. Björck. Gram-schmidt orthogonalization: 100 years and more. *Numer. Linear Algebra Appl.*, 20:492–532, 2013.

[117] M. H. Saad, Y. & Schultz. Gmres: A generalized minimal residual algorithm for solving nonsymmetric linear systems. *SIAM J. Sci. Statist. Comput.*, 7:856–869, 1986.

[118] Yousef Saad. *Iterative Methods for Sparse Linear Systems*. SIAM, 2003.

[119] J. M. Sanz-Serna. Two topics on nonlinear stability. *Advances in Numerical Analysis (W. Light ed.)*, I:147–174, 1991.

[120] Ernst Schröder. über iterirte functionen. *Mathematische Annalen*, 3(2):296–322, 1870.

[121] Ernst Schröder. Über unendlich viele algorithmen zur auflösung der gleichungen. *Mathematische Annalen*, 2(2):317–365, 1870.

[122] H. R. Schwarz. *Numerik symmetrischer Matrizen*. Teubner, 1972.

[123] H. Schwetlik and T. Schütze. Least squares approximation by splines with free knots. *BIT*, 35(3):361–384, 1995.

[124] Daniel Shanks. Non-linear transformation of divergent and slowly convergent sequences. *Journal of Mathematics and Physics*, 34:1–42, 1955.

[125] Avram Sidi. Efficient implementation of minimal polynomial and reduced rank extrapolation methods. *J. of Comp. and Appl. Math.*, 36:305–337, 1991.

[126] Avram Sidi and Jacob Bridger. Convergence and stability analyses for some vector extrapolation methods in the presence of defective iteration matrices. *J. of Comp. and Appl. Math.*, 22:35–61, 1988.

[127] H. Späth. Orthogonal least squares fitting with linear manifolds. *Numer. Math.*, 48:441–445, 1986.

[128] William Squire and George Trapp. Using complex variables to estimate derivatives of real functions. *Siam Review*, 40(1):110–112, 1998.

[129] A. Steiner and M. Arrigoni. Die lösung gewisser räuber-beute-systeme. *Studia Biophysica*, 123(2), 1988.

[130] G. W. Stewart. The economical storage of plane rotations. *Numerische Mathematik*, 25:137–138, 1976.

[131] E. Stiefel. *Einführung in die numerische Mathematik*. Teubner, 1976.

[132] J. Stoer and R. Bulirsch. *Introduction to Numerical Analysis*. Springer, 1991.

[133] Gilbert Strang and George J Fix. *An analysis of the finite element method*, volume 212. Prentice-Hall Englewood Cliffs, 1973.

[134] A.M. Stuart and A.R. Humphries. *Dynamical Systems and Numerical Analysis*. Mathematics. Cambridge University Press, 1998.

[135] V. Szebehely. *Theory of Orbits, The restricted problem of three BODIES*. Acad. Press, New York, 1967.

[136] R.C.E. Tan. Implementation of the topological ε-algorithm. *SIAM J. Sci. Stat. Comput.*, 9(5), 1988.

[137] F. Tisseur and K. Meerbergen. The quadratic eigenvalue problem. *SIAM. Rev*, 43:234–286, 2001.

[138] Joseph F. Traub. *Iterative Methods for the Solution of Equations*. Algorithms and Computation in Mathematics. Prentice Hall, 1964.

[139] L. N. Trefethen. The definition of numerical analysis. SIAM News, November 1992. Available online at http://people.maths.ox.ac.uk/trefethen/publication/PDF/1992_55.pdf.

[140] L. N. Trefethen and D. Bau III. *Numerical Linear Algebra*. SIAM, 1997.

[141] Henk van der Vorst. Bi-CGSTAB: A fast and smoothly converging variant of Bi-CG for the solution of nonsymmetric linear systems. *SIAM J. Sci. Statist. Comput.*, 13:631–644, 1992.

[142] Richard S. Varga. *Matrix Iterative Analysis*. Prentice Hall, first edition, 1962.

[143] Vito Volterra. *Leçon sur la théorie mathématique de la lutte pour la vie*. Cahiers Scientifiques, Paris, 1931.

[144] Urs von Matt. The orthogonal qd-algorithm. *SIAM Journal on Scientific Computing*, 18:1163–1186, 1997.

[145] J. von Neumann and H.H. Goldstine. Numerical inverting of matrices of high order. *Bull. Amer. Math. Soc.*, 53:479–557, 1947.

[146] Gene H. Golub Walter Gander and Rolf Strebel. Least-squares fitting of circles and ellipses. *BIT*, 34:558–578, 1994.

[147] H. Weyl. Das asymptotische Verteilungsgesetz der Eigenwerte linearer partieller Differentialgleichungen (mit einer Anwendung auf die Theorie der Hohlraumstrahlung). *Mathematische Annalen*, 71:441–479, 1912.

[148] J. Wilkinson and C. Reinsch. *Linear Algebra*. Springer, 1971.

[149] J. H. Wilkinson. Error analysis of direct methods of matrix inversion. *Journal of the ACM (JACM)*, Volume 8 Issue 3:281–330, 1961.

[150] J. H. Wilkinson. *The Algebraic Eigenvalue Problem*. Monographs on Numerical Analysis. Oxford Science Publications, 1965.

[151] P. Wynn. On a device for computing the $e_m(s_n)$-transformation. *MTAC*, 10:91–96, 1956.

[152] P. Wynn. General purpose vector epsilon algorithm algol procedures. *Numerische Mathematik*, 6:22–36, 1964.

[153] David M. Young. *Iterative Methods for Solving Partial Difference EQUATIONS of Elliptic Type*. PhD thesis, Harvard University, May 1950.

[154] K. Zuse. *The computer, my life*. Springer, 1993.

Index

W. Gander et al., *Scientific Computing - An Introduction using Maple and MATLAB*,
Texts in Computational Science and Engineering 11,
DOI 10.1007/978-3-319-04325-8,

Editorial Policy

1. Textbooks on topics in the field of computational science and engineering will be considered. They should be written for courses in CSE education. Both graduate and undergraduate textbooks will be published in TCSE. Multidisciplinary topics and multidisciplinary teams of authors are especially welcome.

2. Format: Only works in English will be considered. For evaluation purposes, manuscripts may be submitted in print or electronic form, in the latter case, preferably as pdf- or zipped ps-files. Authors are requested to use the LaTeX style files available from Springer at: http://www.springer.com/authors/book+authors/helpdesk?SGWID=0-1723113-12-971304-0 (Click on → Templates → LaTeX → monographs)

   Electronic material can be included if appropriate. Please contact the publisher.

3. Those considering a book which might be suitable for the series are strongly advised to contact the publisher or the series editors at an early stage.

General Remarks

Careful preparation of manuscripts will help keep production time short and ensure a satisfactory appearance of the finished book.

The following terms and conditions hold:

Regarding free copies and royalties, the standard terms for Springer mathematics textbooks hold. Please write to martin.peters@springer.com for details.

Authors are entitled to purchase further copies of their book and other Springer books for their personal use, at a discount of 33.3% directly from Springer-Verlag.

Series Editors

Texts in Computational Science and Engineering

1. H. P. Langtangen, *Computational Partial Differential Equations.* Numerical Methods and Diffpack Programming, 2nd Edition.
2. A. Quarteroni, F. Saleri, P. Gervasio, *Scientific Computing with MATLAB and Octave*, 3rd Edition.
3. H. P. Langtangen, *Python Scripting for Computational Science*, 3rd Edition.
4. H. Gardner, G. Manduchi, *Design Patterns for e-Science*.
5. M. Griebel, S. Knapek, G. Zumbusch, *Numerical Simulation in Molecular Dynamics*.
6. H. P. Langtangen, *A Primer on Scientific Programming with Python*, 3rd Edition.
7. A. Tveito, H. P. Langtangen, B. F. Nielsen, X. Cai, *Elements of Scientific Computing*.
8. B. Gustafsson, *Fundamentals of Scientific Computing*.
9. M. Bader, *Space-Filling Curves*.
10. M.G. Larson, F. Bengzon, *The Finite Element Method: Theory, Implementation, and Applications*.
11. W. Gander, M.J. Gander, F. Kwok, *Scientific Computing*. An Introduction using Maple and MATLAB.

For further information on these books please have a look at our mathematics catalogue at the following URL: www.springer.com/series/5151

Monographs in Computational Science and Engineering

1. J. Sundnes, G.T. Lines, X. Cai, B.F. Nielsen, K.-A. Mardal, A. Tveito, *Computing the Electrical Activity in the Heart.*

For further information on this book, please have a look at our mathematics catalogue at the following URL: www.springer.com/series/7417

Lecture Notes in Computational Science and Engineering

1. D. Funaro, *Spectral Elements for Transport-Dominated Equations.*
2. H.P. Langtangen, *Computational Partial Differential Equations.* Numerical Methods and Diffpack Programming.
3. W. Hackbusch, G. Wittum (eds.), *Multigrid Methods V.*
4. P. Deuflhard, J. Hermans, B. Leimkuhler, A.E. Mark, S. Reich, R.D. Skeel (eds.), *Computational Molecular Dynamics: Challenges, Methods, Ideas.*

5. D. Kröner, M. Ohlberger, C. Rohde (eds.), *An Introduction to Recent Developments in Theory and Numerics for Conservation Laws.*

6. S. Turek, *Efficient Solvers for Incompressible Flow Problems.* An Algorithmic and Computational Approach.

7. R. von Schwerin, ***M**ulti **B**ody **S**ystem **SIM**ulation.* Numerical Methods, Algorithms, and Software.

8. H.-J. Bungartz, F. Durst, C. Zenger (eds.), *High Performance Scientific and Engineering Computing.*

9. T.J. Barth, H. Deconinck (eds.), *High-Order Methods for Computational Physics.*

10. H.P. Langtangen, A.M. Bruaset, E. Quak (eds.), *Advances in Software Tools for Scientific Computing.*

11. B. Cockburn, G.E. Karniadakis, C.-W. Shu (eds.), *Discontinuous Galerkin Methods.* Theory, Computation and Applications.

12. U. van Rienen, *Numerical Methods in Computational Electrodynamics.* Linear Systems in Practical Applications.

13. B. Engquist, L. Johnsson, M. Hammill, F. Short (eds.), *Simulation and Visualization on the Grid.*

14. E. Dick, K. Riemslagh, J. Vierendeels (eds.), *Multigrid Methods VI.*

15. A. Frommer, T. Lippert, B. Medeke, K. Schilling (eds.), *Numerical Challenges in Lattice Quantum Chromodynamics.*

16. J. Lang, *Adaptive Multilevel Solution of Nonlinear Parabolic PDE Systems.* Theory, Algorithm, and Applications.

17. B.I. Wohlmuth, *Discretization Methods and Iterative Solvers Based on Domain Decomposition.*

18. U. van Rienen, M. Günther, D. Hecht (eds.), *Scientific Computing in Electrical Engineering.*

19. I. Babuška, P.G. Ciarlet, T. Miyoshi (eds.), *Mathematical Modeling and Numerical Simulation in Continuum Mechanics.*

20. T.J. Barth, T. Chan, R. Haimes (eds.), *Multiscale and Multiresolution Methods.* Theory and Applications.

21. M. Breuer, F. Durst, C. Zenger (eds.), *High Performance Scientific and Engineering Computing.*

22. K. Urban, *Wavelets in Numerical Simulation.* Problem Adapted Construction and Applications.

23. L.F. Pavarino, A. Toselli (eds.), *Recent Developments in Domain Decomposition Methods.*

24. T. Schlick, H.H. Gan (eds.), *Computational Methods for Macromolecules: Challenges and Applications.*
25. T.J. Barth, H. Deconinck (eds.), *Error Estimation and Adaptive Discretization Methods in Computational Fluid Dynamics*.
26. M. Griebel, M.A. Schweitzer (eds.), *Meshfree Methods for Partial Differential Equations*.
27. S. Müller, *Adaptive Multiscale Schemes for Conservation Laws*.
28. C. Carstensen, S. Funken, W. Hackbusch, R.H.W. Hoppe, P. Monk (eds.), *Computational Electromagnetics*.
29. M.A. Schweitzer, *A Parallel Multilevel Partition of Unity Method for Elliptic Partial Differential Equations*.
30. T. Biegler, O. Ghattas, M. Heinkenschloss, B. van Bloemen Waanders (eds.), *Large-Scale PDE-Constrained Optimization*.
31. M. Ainsworth, P. Davies, D. Duncan, P. Martin, B. Rynne (eds.), *Topics in Computational Wave Propagation*. Direct and Inverse Problems.
32. H. Emmerich, B. Nestler, M. Schreckenberg (eds.), *Interface and Transport Dynamics.* Computa- tional Modelling.
33. H.P. Langtangen, A. Tveito (eds.), *Advanced Topics in Computational Partial Differential Equations.* Numerical Methods and Diffpack Programming.
34. V. John, *Large Eddy Simulation of Turbulent Incompressible Flows.* Analytical and Numerical Results for a Class of LES Models.
35. E. Bänsch (ed.), *Challenges in Scientific Computing - CISC 2002.*
36. B.N. Khoromskij, G. Wittum, *Numerical Solution of Elliptic Differential Equations by Reduction to the Interface.*
37. A. Iske, *Multiresolution Methods in Scattered Data Modelling.*
38. S.-I. Niculescu, K. Gu (eds.), *Advances in Time-Delay Systems.*
39. S. Attinger, P. Koumoutsakos (eds.), *Multiscale Modelling and Simulation.*
40. R. Kornhuber, R. Hoppe, J. Périaux, O. Pironneau, O. Wildlund, J. Xu (eds.), *Domain Decomposition Methods in Science and Engineering.*
41. T. Plewa, T. Linde, V.G. Weirs (eds.), *Adaptive Mesh Refinement – Theory and Applications.*
42. A. Schmidt, K.G. Siebert, *Design of Adaptive Finite Element Software.* The Finite Element Toolbox ALBERTA.
43. M. Griebel, M.A. Schweitzer (eds.), *Meshfree Methods for Partial Differential Equations II.*

44. B. Engquist, P. Lötstedt, O. Runborg (eds.), *Multiscale Methods in Science and Engineering.*

45. P. Benner, V. Mehrmann, D.C. Sorensen (eds.), *Dimension Reduction of Large-Scale Systems.*

46. D. Kressner, *Numerical Methods for General and Structured Eigenvalue Problems.*

47. A. Boriçi, A. Frommer, B. Joó, A. Kennedy, B. Pendleton (eds.), *QCD and Numerical Analysis III.*

48. F. Graziani (ed.), *Computational Methods in Transport.*

49. B. Leimkuhler, C. Chipot, R. Elber, A. Laaksonen, A. Mark, T. Schlick, C. Schütte, R. Skeel (eds.), *New Algorithms for Macromolecular Simulation.*

50. M. Bücker, G. Corliss, P. Hovland, U. Naumann, B. Norris (eds.), *Automatic Differentiation: Applications, Theory, and Implementations.*

51. A.M. Bruaset, A. Tveito (eds.), *Numerical Solution of Partial Differential Equations on Parallel Computers.*

52. K.H. Hoffmann, A. Meyer (eds.), *Parallel Algorithms and Cluster Computing.*

53. H.-J. Bungartz, M. Schäfer (eds.), *Fluid-Structure Interaction.*

54. J. Behrens, *Adaptive Atmospheric Modeling.*

55. O. Widlund, D. Keyes (eds.), *Domain Decomposition Methods in Science and Engineering XVI.*

56. S. Kassinos, C. Langer, G. Iaccarino, P. Moin (eds.), *Complex Effects in Large Eddy Simulations.*

57. M. Griebel, M.A Schweitzer (eds.), *Meshfree Methods for Partial Differential Equations III.*

58. A.N. Gorban, B. Kégl, D.C. Wunsch, A. Zinovyev (eds.), *Principal Manifolds for Data Visualization and Dimension Reduction.*

59. H. Ammari (ed.), *Modeling and Computations in Electromagnetics: A Volume Dedicated to Jean-Claude Nédélec.*

60. U. Langer, M. Discacciati, D. Keyes, O. Widlund, W. Zulehner (eds.), *Domain Decomposition Methods in Science and Engineering XVII.*

61. T. Mathew, *Domain Decomposition Methods for the Numerical Solution of Partial Differential Equations.*

62. F. Graziani (ed.), *Computational Methods in Transport: Verification and Validation.*

63. M. Bebendorf, *Hierarchical Matrices.* A Means to Efficiently Solve Elliptic Boundary Value Problems.

64. C.H. Bischof, H.M. Bücker, P. Hovland, U. Naumann, J. Utke (eds.), *Advances in Automatic Differentiation.*

65. M. Griebel, M.A. Schweitzer (eds.), *Meshfree Methods for Partial Differential Equations IV.*

66. B. Engquist, P. Lötstedt, O. Runborg (eds.), *Multiscale Modeling and Simulation in Science.*

67. I.H. Tuncer, Ü. Gülcat, D.R. Emerson, K. Matsuno (eds.), *Parallel Computational Fluid Dynamics 2007.*

68. S. Yip, T. Diaz de la Rubia (eds.), *Scientific Modeling and Simulations.*

69. A. Hegarty, N. Kopteva, E. O'Riordan, M. Stynes (eds.), *BAIL* 2008 *– Boundary and Interior Layers.*

70. M. Bercovier, M.J. Gander, R. Kornhuber, O. Widlund (eds.), *Domain Decomposition Methods in Science and Engineering XVIII.*

71. B. Koren, C. Vuik (eds.), *Advanced Computational Methods in Science and Engineering.*

72. M. Peters (ed.), *Computational Fluid Dynamics for Sport Simulation.*

73. H.-J. Bungartz, M. Mehl, M. Schäfer (eds.), *Fluid Structure Interaction II – Modelling, Simulation, Optimization.*

74. D. Tromeur-Dervout, G. Brenner, D.R. Emerson, J. Erhel (eds.), *Parallel Computational Fluid Dynamics 2008.*

75. A.N. Gorban, D. Roose (eds.), *Coping with Complexity: Model Reduction and Data Analysis.*

76. J.S. Hesthaven, E.M. Rønquist (eds.), *Spectral and High Order Methods for Partial Differential Equations.*

77. M. Holtz, *Sparse Grid Quadrature in High Dimensions with Applications in Finance and Insurance.*

78. Y. Huang, R. Kornhuber, O. Widlund, J. Xu (eds.), *Domain Decomposition Methods in Science and Engineering XIX.*

79. M. Griebel, M.A. Schweitzer (eds.), *Meshfree Methods for Partial Differential Equations V.*

80. P.H. Lauritzen, C. Jablonowski, M.A. Taylor, R.D. Nair (eds.), *Numerical Techniques for Global Atmospheric Models.*

81. C. Clavero, J.L. Gracia, F. Lisbona (eds.), *BAIL 2010 – Boundary and Interior Layers, Computational and Asymptotic Methods.*

82. B. Engquist, O. Runborg, Y.R. Tsai (eds.), *Numerical Analysis and Multiscale Computations.*

83. I.G. Graham, T.Y. Hou, O. Lakkis, R. Scheichl (eds.), *Numerical Analysis of Multiscale Problems.*

84. A. Logg, K.-A. Mardal, G. Wells (eds.), *Automated Solution of Differential Equations by the Finite Element Method.*

85. J. Blowey, M. Jensen (eds.), *Frontiers in Numerical Analysis - Durham 2010.*

86. O. Kolditz, U.-J. Gorke, H. Shao, W. Wang (eds.), *Thermo-Hydro-Mechanical-Chemical Processes in Fractured Porous Media - Benchmarks and Examples.*

87. S. Forth, P. Hovland, E. Phipps, J. Utke, A. Walther (eds.), *Recent Advances in Algorithmic Differentiation.*

88. J. Garcke, M. Griebel (eds.), *Sparse Grids and Applications.*

89. M. Griebel, M. A. Schweitzer (eds.), *Meshfree Methods for Partial Differential Equations VI.*

90. C. Pechstein, *Finite and Boundary Element Tearing and Interconnecting Solvers for Multiscale Problems.*

91. R. Bank, M. Holst, O. Widlund, J. Xu (eds.), *Domain Decomposition Methods in Science and Engineering XX.*

92. H. Bijl, D. Lucor, S. Mishra, C. Schwab (eds.), *Uncertainty Quantification in Computational Fluid Dynamics.*

93. M. Bader, H.-J. Bungartz, T. Weinzierl (eds.), *Advanced Computing.*

94. M. Ehrhardt, T. Koprucki (eds.), *Advanced Mathematical Models and Numerical Techniques for Multi-Band Effective Mass Approximations.*

95. M. Azaïez, H. El Fekih, J.S. Hesthaven (eds.), *Spectral and High Order Methods for Partial Differential Equations ICOSAHOM 2012.*

96. M.P. Desjarlais, F. Graziani, R. Redmer, S.B. Trickey (eds.), *Frontiers and Challenges in Warm Dense Matter.*

97. J. Garcke, D. Pflüger (eds.), *Sparse Grids and Applications - Munich 2012.*

98. J. Erhel, M. Gander, L. Halpern, G. Pichot, T. Sassi, O. Widlund (eds.), *Domain Decomposition Methods in Science and Engineering XXI.*

99. R. Abgrall, H. Beaugendre, P.M. Congedo, C. Dobrzynski, M. Ricchiuto, V. Perrier (eds.), *High Order Nonlinear Numerical Methods for Evolutionary PDEs - HONOM 2013.*

For further information on these books please have a look at our mathematics catalogue at the following URL: www.springer.com/series/3527